

SECRETS OF THE EARTH

by Aika Tsubota



SECRETS OF THE EARTH



Aika Tsubota

Born on November 26, 1979 in Hirata-city, Shimane, Japan

Died on December 27, 1991 (Sixth-grade, Nishino Elementary School)

SECRETS OF THE EARTH

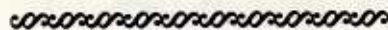
"Life itself evolved in the sea." "But, now the world's oceans are threatened by pollution." These lines are taken from a remarkable comic book created by Aika Tsubota that teaches environmental awareness. Aika was a sixth-grader from Shimane Prefecture when she was suddenly stricken and passed away in December, 1991 at the tender age of twelve. As a fitting memorial to the memory of their daughter, Aika's parents had the book bound to give to Aika's classmates and teachers. The book created such an impression that all the younger grade children wanted to read it too, so Aika's thoughts and pictures reached the whole school and have been spreading more widely.

Aika's cartoons, now entitled *Secrets of the Earth*, were created over a two-month period to fulfill an assignment from her homeroom to somehow present environmental issues so clearly that even first-graders can understand. But in the predawn hours of December 26, 1991 - just a matter of hours after she had finished her project - Aika woke up with excruciating pain in her head. The diagnosis of cerebral hemorrhage offered no hope, and Aika died next morning.

Aika skillfully weaves the major environmental issues into her story, including the idea that protecting the environment means maintaining as many different life forms as possible, and the problems of acid rain and destruction of the ozone layer. Even the complicated mechanisms behind these phenomena are explained in easy-to-understand cartoon style. She cordially appealed the importance of international cooperation, the problems between the developed and the developing countries. She wanted everyone to be aware of the environmental problems, grass-roots citizens' movements, and reducing the vast amounts of garbage we produce today.

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DEAR READERS,

SECRETS OF THE EARTH WAS WRITTEN IN JAPANESE WHICH IS READ FROM RIGHT TO LEFT—NOT LEFT TO RIGHT LIKE ENGLISH BOOKS. SO, IN READING AIKA'S COMIC, BE SURE TO READ THE RIGHT FRAME OF EACH PAGE FIRST AND THEN THE LEFT FRAME.

ALSO THE ORIGINAL MANUSCRIPTS WERE NOT PAINTED EXCEPT 3 FRAMES IN COLORS. SO THIS BOOK HAS BEEN PAINTED IN COLORS BASED ON THESE FRAMES AS AIKA'S COLOR IMAGINATION.

MAIN CHARACTERS



RUMI
A SIXTH-GRADER
WHO IS AN
AVID READER



EIICHI
A SIXTH-GRADER
WITH AN
INSATIABLE
CURIOSITY



EARTH
MAGICALLY POPS OUT OF THE
PAGES OF A BOOK RUMI CHECKED
OUT OF THE LIBRARY.
KNOWS ALL THERE IS TO KNOW
ABOUT OUR PLANET, EARTH.





EXPLORING THE HISTORY OF THE EARTH!!



200 million to 65 million years ago

About 4 1/2 billion years ago

About 4 million to 1 million years ago

The rise of the dinosaurs.

The planets of the solar system were formed from a cloud of cosmic dust and gas.

Ape-man

About 400 million years ago

Dust particles formed into lumps of matter, then into bigger chunks, and finally into full-sized planets.

Fish rise to dominance of the oceans.

The early Earth was hot and molten, but finally cooled down so the surface hardened.

Primitive man

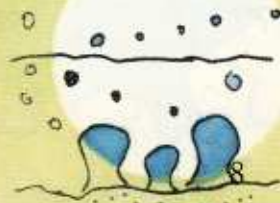
Plants moved onto dry land.

Water vapor condensed and settled to form oceans, and one-celled life-forms evolved deep in the ocean depths.

Stone-age man

Blue-green algae evolved that produced an oxygen atmosphere for the Earth.

About 3 1/2 billion years ago







BALANCE IN THE NATURAL WORLD!!



Soil Supports Life

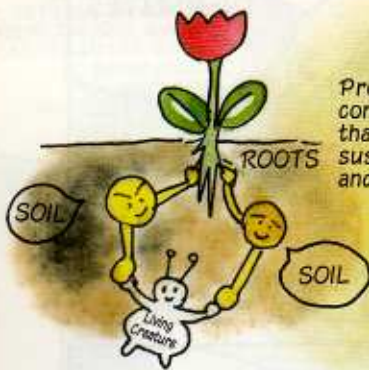
Soil started to be formed 400 million years ago as rock was broken into tiny particles and organic material accumulated. It is the indispensable stuff that nourishes and sustains the diverse plant life on Earth. The soil teems with billions of living microorganisms that make the soil richer and more productive. A highly productive soil is the key to abundant, flourishing life on Earth!

Trees are anchored firmly in the soil, and their roots reach down to tap nutrients so they can flourish and produce more leaves. And not just mineral nutrients. Soil also contains air spaces, water, sand, clay, and decaying organic litter to sustain plants and all the other living things on Earth.

(Reprinted with permission from Earth SOS.)

SOIL IN ACTION!

— Soil protects the environment —



Productive, good soil consists of little particles that are stuck together to sustain microorganisms and plant roots.

OH BOY!
ANOTHER LEAF!



Microorganisms clean the soil by breaking down dead plant and animal debris to make nutrients that are absorbed by tree roots.

SCRAM



Soil purifies water passing through it by filtering out bacteria and other noxious impurities.



Soil neutralizes toxic substances by giving off something that grabs onto the poison so it can't do any harm.

Erosion

Without plant cover, soil particles lose their tendency to stick together, so rain can wash the soil down slopes causing mud and landslides.



THAT'S FOR SURE!



I BET YOU'LL APPRECIATE "PLAIN OLD" SOIL FROM NOW ON!



25

WHAT'S NEXT ON THE AGENDA?



PERFECT SENSE THANKS TO YOU!



28

AND FIND OUT HOW PLANTS AND ANIMALS ARE RELATED!



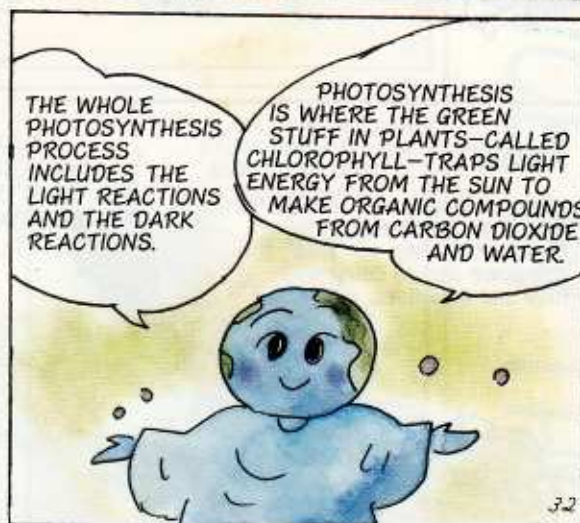
WELL, LET'S PICK UP WHERE WE LEFT OFF....

29

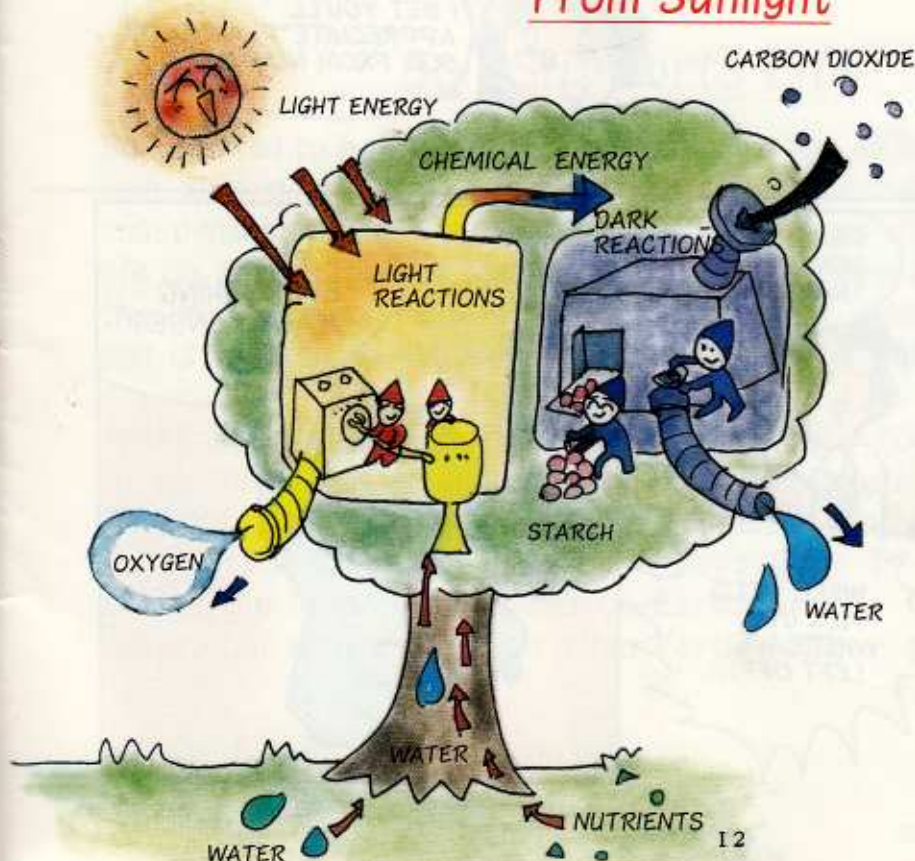
DID EVERYTHING MAKE SENSE?



27



Creation of Organic Compounds From Sunlight



In the light reactions, the green chlorophyll in plants traps sunlight, which is used to split water to make chemical energy.

Oxygen is given off in the process which is vital for us and all animals to live, because that's what we breathe.

The chemical energy produced in the light reactions is used to make molecules of starch. These steps don't require light so they're called the dark reactions. Starch is the end product that green plants use to grow and multiply.





PLANTS ARE THE PRODUCERS BECAUSE THEY'RE THE ONLY ONES THAT CAN MAKE ENERGY-CONTAINING ORGANIC MATERIAL FROM SUNLIGHT AND BASIC NUTRIENTS IN THE SOIL. ANIMALS ARE THE CONSUMERS BECAUSE THEY EAT THE PRODUCERS OR OTHER CONSUMERS. AT THE END OF THE LINE, THE DECOMPOSERS-BACTERIA AND FUNGI IN THE SOIL-DEGRADE LEAVES THAT FALL ON GROUND AND DEAD CONSUMERS. THE DECOMPOSERS RETURN SIMPLE NUTRIENTS TO THE SOIL, WHERE THEY ARE TAKEN UP AGAIN BY THE ROOTS OF PLANTS, AND THE WHOLE PROCESS STARTS OVER AGAIN.

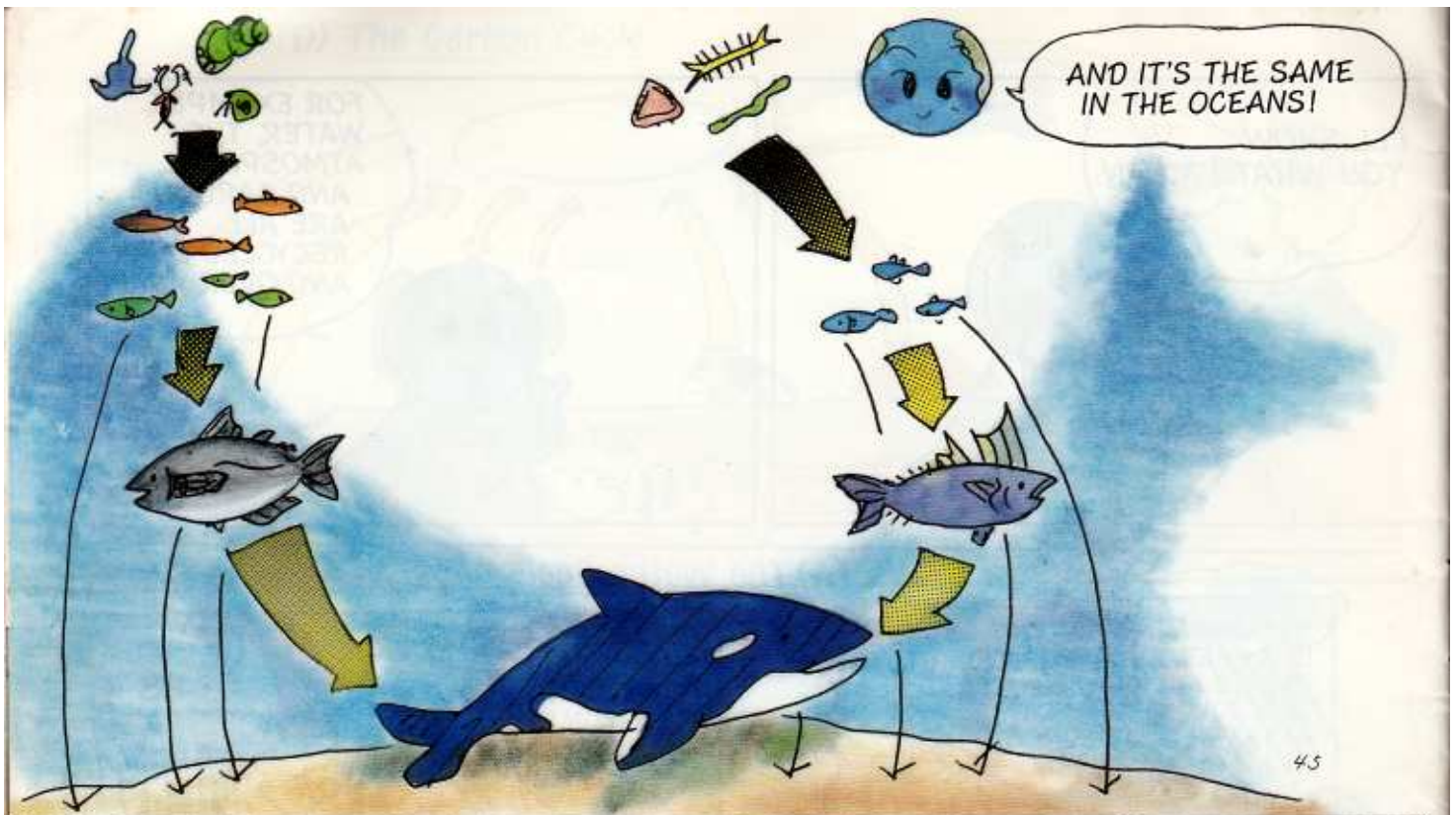


WELL, WE ALREADY LEARNED THAT GREEN PLANTS USE SUNLIGHT AND BASIC NUTRIENTS FROM THE SOIL TO GROW. PLANT-EATING ANIMALS CALLED HERBIVORES COME ALONG AND EAT THE PLANTS, THEN MEAT-EATING ANIMALS CALLED CARNIVORES EAT THE PLANT-EATING ANIMALS.

43



44



I'LL SHOW YOU WHAT I MEAN.



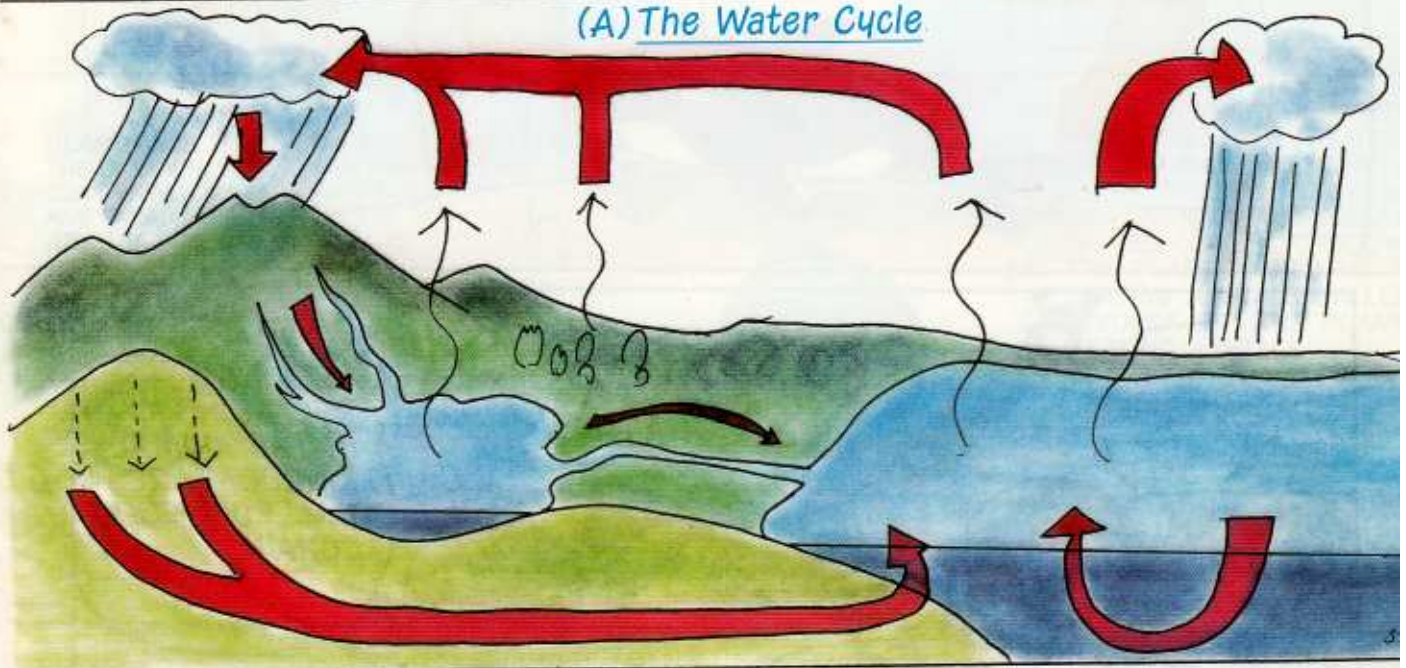
30

FOR EXAMPLE, WATER, THE ATMOSPHERE, AND CARBON ARE ALL RECYCLED OVER AND OVER AGAIN.



49

(A) The Water Cycle



(C) Circulation Patterns of the Atmosphere

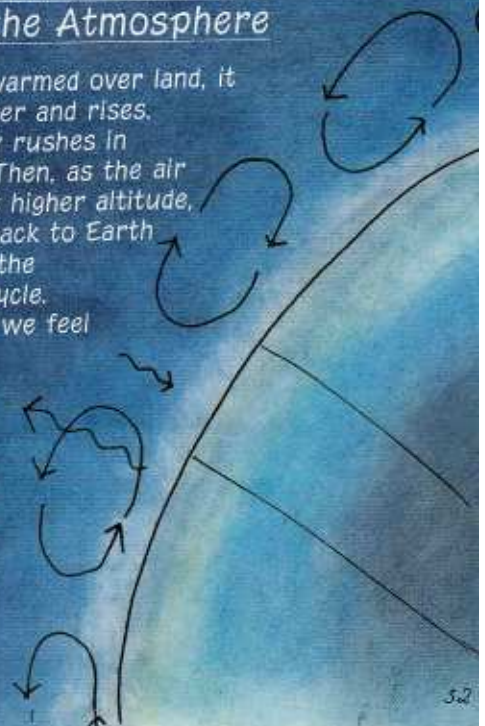


There are 3 main wind systems in the Northern Hemisphere. Starting from the equator: the trade winds, the westerlies, and the polar easterlies. In the Southern Hemisphere it's just the same.

53

(B) Convection Currents of the Atmosphere

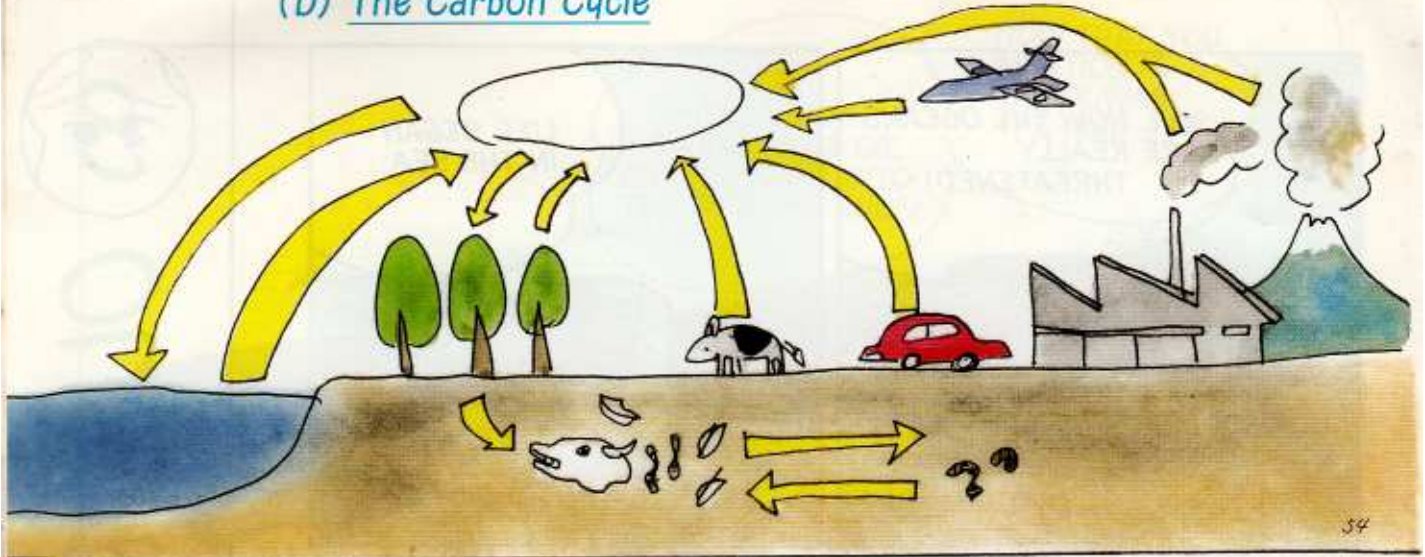
When air is warmed over land, it becomes lighter and rises. More cool air rushes in underneath. Then, as the air loses heat at higher altitude, it descends back to Earth to complete the circulation cycle. This is what we feel as wind.



16

52

(D) The Carbon Cycle



BUT,
CARBON??

AND
CIRCULATION
OF THE
ATMOSPHERE
MAKES
SENSE....

56

WATER IS EVAPORATED
FROM THE OCEANS AND
LAKES, THEN CONDENSES
TO MAKE CLOUDS, AND
COMES BACK TO EARTH
AS RAIN AND SNOW.

55

THE CARBON CYCLE IS RELATED TO
THE FLOW OF ENERGY THROUGH
THE ECOSYSTEM, BECAUSE ENERGY
IS STORED IN OUR BODIES AS ORGANIC
COMPOUNDS. THE CYCLE STARTS
WITH CARBON IN THE ATMOSPHERE IN THE
FORM OF CARBON DIOXIDE. GREEN
PLANTS USE THAT CARBON AND TURN IT
INTO SOLID MATERIAL BY
PHOTOSYNTHESIS.

SOLID CARBON STAYS IN THE BODY
OF THE PLANT UNTIL THE PLANT
DIES OR IS EATEN BY ANIMALS.
WHEN PLANTS AND ANIMALS DIE,
THEIR BODIES ARE BROKEN DOWN
BY THE DECOMPOSERS, AND THE
CARBON IS RELEASED BACK TO
THE ATMOSPHERE SO THE
CYCLE CAN START ALL OVER
AGAIN.

57

ALL THESE WONDERFUL
CYCLES WOULD JUST KEEP
GOING LIKE CLOCKWORK,
BUT NOW THE EARTH IS
IN SERIOUS TROUBLE....

NATURE IS
INCREDIBLE!

59

17

58



OUR PLANET TODAY!!

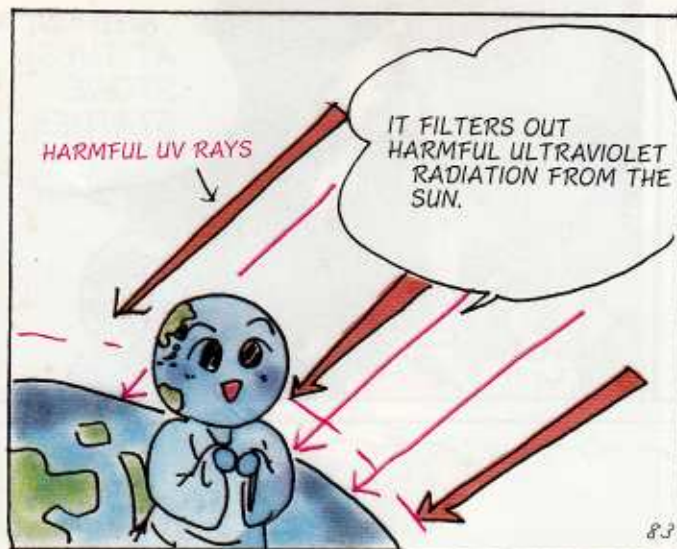




72

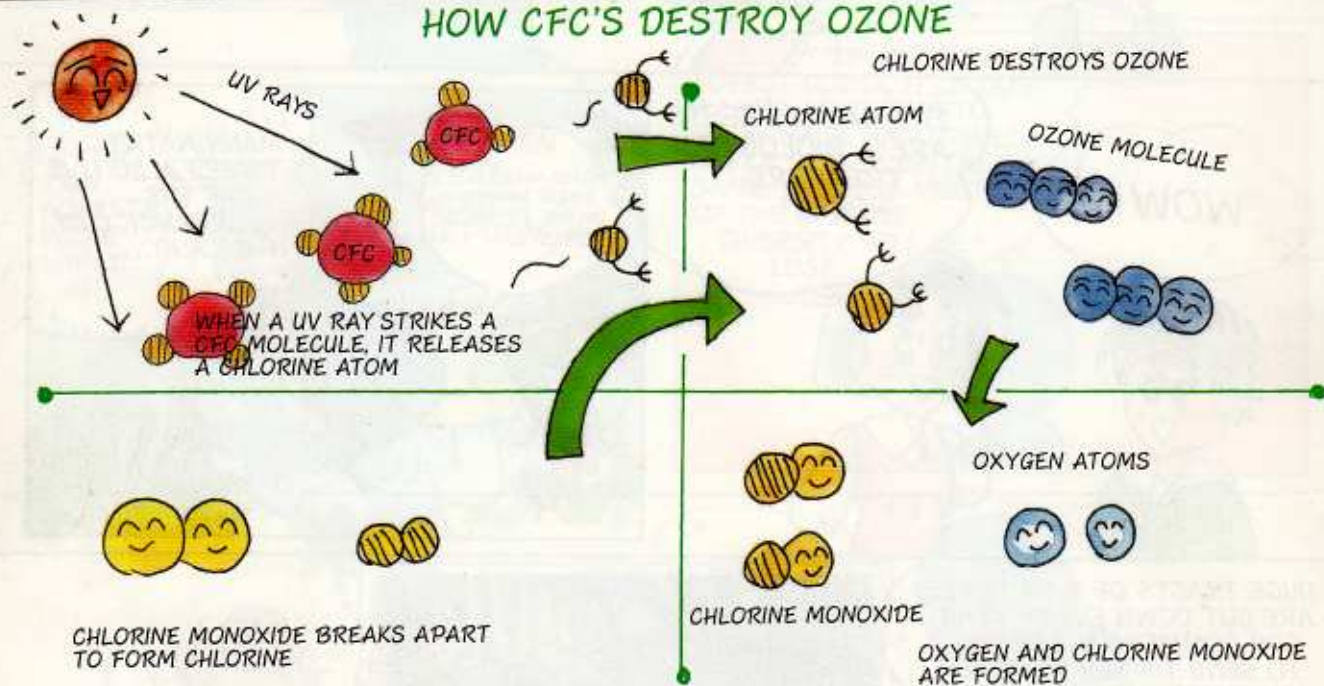




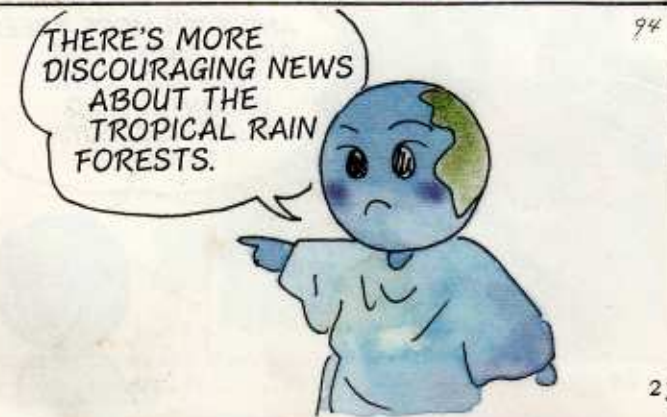


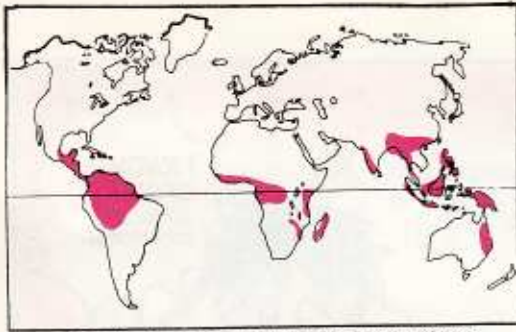


HOW CFC'S DESTROY OZONE



WITHOUT OUR OZONE SHIELD TO PROTECT US FROM HARMFUL SOLAR RAYS, WE'D HAVE TO BURROW UNDERGROUND OR LIVE UNDER THE WATER... BUT THAT'S NO SOLUTION. WITH NOBODY UP ON THE SURFACE, WE COULDN'T LAST UNDERGROUND FOR VERY LONG....





▲ Rain forests encircle the globe close to the equator.

JUNGLE ANIMALS HUNT FOR FOOD. LEGIONS OF BIRDS CHATTER IN THE TREE TOPS, INSECTS SCURRY ON THE FOREST FLOOR.

THE RAIN FORESTS ENCIRCLE THE GLOBE CLOSE TO THE EQUATOR, CUTTING ACROSS SOUTHEAST ASIA, AFRICA, AND SOUTH AMERICA. THEY ONLY COVER 6% OF THE LAND, BUT RAIN FORESTS SHELTER MORE THAN HALF THE KINDS OF PLANTS AND ANIMALS IN THE WORLD!



95

WOW!

THE RAIN FORESTS ARE A BIOLOGICAL TREASURE-HOUSE!

AND MAKE THEIR HOMES IN THE TROPICAL FORESTS.

MANY NATIVE TRIBES ALSO LIVE OFF THE ABUNDANCE OF THE LAND....



97

96

HUGE TRACTS OF RAIN FOREST ARE CUT DOWN EVERY YEAR FOR COMMERCIAL LOGGING TO SEND TIMBER TO OTHER COUNTRIES, INCLUDING JAPAN.



▲ Logging the rain forests.

THEY'RE CUTTING THE TREES DOWN!



98

WHAT A WASTE!

AND EVEN MORE TREES ARE CLEARED FOR UNMANAGED AND UNCONTROLLED SLASH-AND-BURN FARMING.

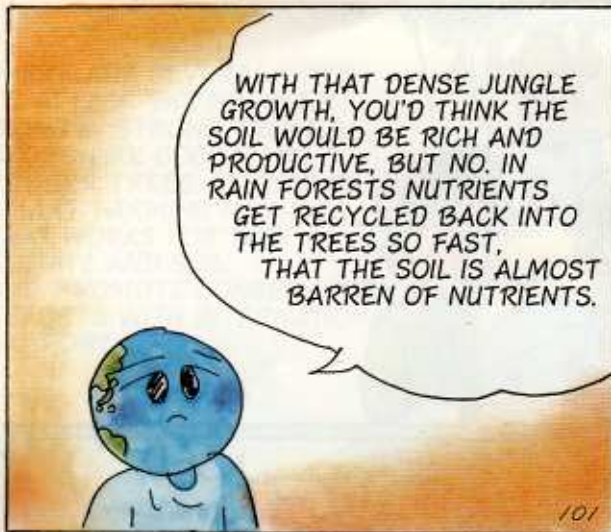


Forest being destroyed for slash-and-burn farming.

24



99



THEN ALL THE JUNGLE WILDLIFE WILL GO TOO, BECAUSE THEY'LL LOSE THEIR NATURAL HABITAT.



105



107



106

MOST OF THE RAIN FORESTS ARE LOCATED IN COUNTRIES THAT ARE STILL DEVELOPING. SO NATURALLY THEY WANT TO USE THEIR FOREST RESOURCES TO GET MONEY FOR DEVELOPMENT. PLUS, MOST OF THE PEOPLE IN THE COUNTRYSIDE MAKE THEIR LIVING FROM SLASH-AND-BURN FARMING.

SO TELLING THESE PEOPLE NOT TO CUT TREES IS LIKE TELLING THEM TO POSTPONE THEIR DEVELOPMENT OR GIVE UP AN IMPORTANT LIVELIHOOD.



108

THERE ARE SEVERAL WAYS TO ATTACK THE PROBLEM: BRING IN STRONG TROPICAL CROPS LIKE COCOA AND RUBBER TREES, INTRODUCE SMART FARMING METHODS THAT WORKS FOR THAT CLIMATE AND SOIL, AND PROMOTE CONSERVATION EFFORTS WITH INTERNATIONAL SUPPORT.

WE NEED A PLAN THAT LEAVES THE TREES STANDING, BUT PUTS MONEY IN PEOPLE'S POCKETS SO THEY CAN LIVE.

THAT'S WHAT I WANTED TO HEAR!!

YOU'VE BEEN TELLING US HOW THE EARTH IS THREATENED....I JUST HAPPENED TO THINK, ISN'T THERE ANYTHING WE CAN DO TO HELP?

LET'S PUT OUR HEADS TOGETHER, AND THINK OF WAYS TO SAVE THE EARTH!

HERE'S SOME
OF THE WAYS
PEOPLE HELP
....



1/4

MANY PEOPLE ARE
ALREADY INVOLVED
IN HELPING THE EARTH!



1/3

Public awareness groups investigate local and global environmental problems, then spread the word so everybody knows the situation.



International cooperation NGO's are groups that aren't connected with the U.N. or any government that provide overseas cooperation and aid. They are active all around the world.



Citizens' movements aren't just confined to local communities. There are grass-roots groups working on international and even worldwide environmental issues.



1/5

There are lots of things we can do as individuals everyday to help the environment. It's important for people to become aware and start doing the things they're easily capable of doing.



WORKING TOGETHER TO PROTECT THE EARTH!!



Convention on Protection of the Ozone Layer



Pledges support to study the ozone protection shield, ozone-damaging chemicals, and ways to stop further loss of ozone.

Convention on Migration of Birds Across National Borders



Signed by Japan, the U.S., Australia, China, and Russian Federation, this agreement protects birds that migrate across national borders.

Ramsar Convention on Wetlands of International Importance



Protects diminishing wetland areas, the habitat of many birds, animals, and plants.

Convention on International Trade on Endangered Species



Enforces a ban curbing trade in plants and animals that are in danger of extinction.

Vienna Convention



Agreement among the U.S. and countries of Europe outlining ways to fight acid rain.

United Nations Convention on the Law of the Sea



A broad agreement covering all aspects of the world's oceans, including measures to prevent further pollution of the seas.

AND THERE ARE ALL KINDS OF LITTLE EVERYDAY THINGS WE CAN ALL DO TO HELP!

I NEVER KNEW THERE WERE SO MANY TREATIES ABOUT WILDLIFE AND THE ENVIRONMENT!



119

AND I READ THAT IF YOU'RE CAREFUL HOW YOU USE WATER, YOU CAN SAVE A WHOLE SWIMMING POOL'S WORTH OF WATER EVERY YEAR!



121

SURE, THE SIXTH GRADERS COLLECTED ALUMINUM CANS!



120

HERE'S MORE TIPS FOR SAVING WATER....

DON'T LET THE WATER RUN TILL IT GETS COLD—KEEP SOME DRINKING WATER IN THE REFRIGERATOR.



THERE'S LOTS OF WAYS TO SAVE WATER....



122

GET A WATER-SAVER SHOWER HEAD, AND YOU CAN SAVE 50 LITERS!



DON'T LEAVE THE WATER RUNNING WHEN YOU BRUSH YOUR TEETH.... PUT SOME WATER IN A GLASS.



EVERYBODY KNOWS ABOUT THESE WAYS!





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124

CONSUMER AWARENESS AND THE EARTH!

THE CO-OP'S IN JAPAN USE THIS MARK!



▲Identifies Co-op products that are friendly to the environment

GENTLE TO THE EARTH!

THIS MARK GOES ON PRODUCTS THAT ARE FRIENDLY TO THE ENVIRONMENT.



▲In use throughout Japan

126

AND THE 20TH OF EVERY MONTH IS "NO DRIVING DAY." PEOPLE TRY TO LEAVE THEIR CARS AT HOME ON THOSE DAYS AND TAKE PUBLIC TRANSPORT.



128

BUYING ECO-MARK PRODUCTS IS ONE WAY TO HELP THE ENVIRONMENT, BECAUSE THOSE PRODUCTS CONSERVE NATURAL RESOURCES AND WON'T HARM THE OZONE.



127



130



129



131



133

32



132



135



134



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WHAT HAPPENED AFTER THAT







FINAL REFLECTIONS

As I was writing this book, I was thinking mostly about people living in Africa and Southeast Asia. Young people in many of these countries—even younger than me—have to drop out of school to help support their families. This is really a sad thing, because limited education usually means people don't get very far in life. Plus, school is just plain interesting! You learn all kinds of fascinating things by attending school. The only way this is going to change is to put an end to war and bring everybody's standard of living up. I realize that I'm one of the lucky few: I can stay in school as long as I want, I get three square meals a day and live in a comfortable house. If possible, I'd like to do something with my life to help bridge the gap between rich and poor countries. Maybe if I study really hard and become a medical doctor I can help people that way.

Regarding the environment, the most important thing is for people to stop thinking they can't do anything just because they are only one individual. If everybody thought that way, planet Earth really would be doomed!

If everybody pitches in, I know we can turn this world into a beautiful place!

SAVE THE SEA

Environmental issues have now reached such proportions that they affect and concern the entire world. In the past, one technological innovation after another have given those of us who inhabit industrialized countries lives of incredible ease and comfort. But now, it is apparent that this luxury has been bought at tremendous cost to the environment. All sorts of worrisome problems are surfacing, seemingly all at once: the greenhouse effect, ozone holes, mountains of garbage almost exceeding our ability to process, and polluted oceans. While it's good that people are finally starting to wake up to the fact that a real problem exists, all too few comprehend the true magnitude of the crisis and are moving to do anything about it.

No country has benefited from the world's great oceans more than the island nation of Japan. The nurturing medium of life itself, the oceans have been yielding bountiful harvests of fish and seaweed for thousands of years on end. The oceans have served as maritime highways bringing cultural treasures from afar, have inspired countless generations with their majestic beauty, have shown us the awesome power of nature, and have even on occasion provided security against invasion. Most importantly, with some 70.3 percent of it's surface covered by water, the earth is unique in the solar system—the earth could well be renamed the hydro-planet. And yet we've grown so accustomed to these great bodies of water and their abundant wealth, that we take the oceans for granted and forget how absolutely essential they are.

Now mankind has passed the point of global exploitation and entered a new era of global protection. If we allow present pollution trends to continue, we might very well be denying our children and grandchildren the wonder and beauty of the oceans and unpolluted skies overhead.

This is the message, this is the warning that the SAVE THE SEA campaign will be delivering across the world. We are going to shake people out of their complaisance, make them aware of the true dimensions of the crisis, and get a broad cross section of people focused on environmental issues and how they can be resolved.

SAVE THE SEA Campaign Committee, Japan

Kiyoshi Awazu, Chairman of the Executive Committee

Credo of the Seas

Live as gentle stewards on the planet

Commune with the nurturing gentleness of the sea.

Listen attentively to the voice of the sea, of the wind, and of all the great diversity of life.

Empathize with sea and all its inhabitants—the shell and other fish, the whales. Know the teeming life of the sea.

The world's oceans are the very cradle of life; they are not for us to despoil. Know ignorance and potential tragedy.

Each and everyone of us is a part of nature; when we despoil nature, we despoil ourselves.

The time to act is now. Speak out forcefully and clearly so our message to SAVE THE SEA will reverberate across the world.



SAVE THE SEA

SAVE THE SEA

Save the sea

Save the wind

Save the rain

Oh people, people,

Can't you hear the trembling of life?

Oh people, people,

Can't you hear the crying of life?

Save the sea

Save the wind

Save the rain

Save the forests

Save the rivers

Save the earth

Oh people, people,

Can't you hear the trembling of life?

Oh people, people,

Can't you hear the crying of life?

Save the forests

Save the rivers

Save the earth

Versifier : MAHYAH



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(In no special order)

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The Japan Trust for Global Environment
Fujiki Kaiun Group
Foundation for Global Peace and Environment



Cartoons and Texts Creator	:	Aika Tsubota
Photography Courtesy (Page 21, 36)	:	Kyodo News
Assistant Producer	:	Yumi Negoro
Printer	:	Shiba Kikaku Printing Co., Ltd.
Publisher & Copyright Administrator	:	SAVE THE SEA Campaign Committee, Japan
	:	No.3 Yoshida Bldg., 3-13-4, Akasaka
	:	Minato-ku, Tokyo 107 Japan
	:	Phone: 03-5570-0577 Fax: 03-3582-5226

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